

NOTES ON SOME NORTH AMERICAN ASCLEPIADS

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For nearly ten years I have been engaged more or less actively in a revision of the species of *Asclepias* in the United States. The problem has been complicated and its completion delayed by a number of factors, particularly the need of delineation of the genus with respect to the other American genera of Asclepiadaceae. World War II brought its own complications, all too familiar to any systematist, in this case the chief of which was the enlistment in the "Seabees" of Albert A. Heinze, long my collaborating illustrator. With the indefinite duration of these hindrances in mind, I have thought it best to publish occasional novelties; I now offer some notes concerning the nomenclature and identity of a few of our North American Asclepiads, not only because they should have been discussed long ago, but because I intend to publish in the near future some observations on their geographical variation.

ASCLEPIAS MEXICANA HBK. VS. *A. FASCICULARIS* DCNE.

One of the most frequent Milkweeds of our western states is "*Asclepias mexicana*" of nearly all American authors, which ranges roughly from Idaho to Nevada and westward to the Pacific Coast. It is a member of the *incarnata*-alliance of the subgen. *Euasclepias*, having narrowly stipitate gynostegia, whorled leaves, and paired or clustered inflorescences at the upper nodes. The flowers are grayish-pink to white, and, as is usual in this alliance of the subgenus, offer few structural peculiarities indeed, the only one coming to mind at the moment being the attachment of the corona horn usually at the middle, rather than at the base, of the hood.

Apparently the best diagnostic characters of the species, again as is usual in its alliance, are found in the leaf-branch system. The phyllotaxy is particularly notable, that upon the main stem and flowering branches being predominantly ternate, but occasionally quaternate or even opposite. In addition to the flowering branches of normal size, the species is distinguished usually at a glance by means of dwarf axillary branches which do not flower as a rule and lend to the plant a somewhat "heterophyllous" aspect because of their usually smaller, predominantly opposite leaves. In any case, the stems and branches are either glabrous or inconspicuously and generally pubescent, without the appearance of pubescent "lines" which will be discussed presently in other connections. This species may well extend northward into southern British Columbia and southward into Baja California, although the herbarium of the Missouri Botanical Garden has no supporting evidence.

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"*Asclepias mexicana*" of the western United States invariably is credited to Cavanilles (Ic. 1:42. pl. 58. 1791), and an examination of the original description and illustration alone might not appear to bar such an interpretation. The former, as one might fear, is somewhat vague, and conveys as its most important clues that the leaves of the plant are whorled and about three inches long by three lines broad. The illustration is rather conventional in the antique manner, and shows 5-6 lance-elliptic leaves in a close whorl, without axillary branches, and with highly generalized inflorescences. No locality is cited by Cavanilles, although a majority of his Mexican species are known to have been collected in the mountainous districts in the vicinity of Mexico City (as in the case of *A. Linaria*, "*prope Mexico et Chalco*"), and there is some justification for the assumption that his *A. mexicana* might well have been from the same region.

As a matter of fact, this assumption virtually is proved by the Mexican *exsiccatae* labelled "*A. mexicana* Cav.," a fair number of which occur in American herbaria. Attention is first directed to such specimens in the herbarium of the Missouri Botanical Garden when it is noted that they came not from districts contiguous to the distribution of "*A. mexicana*" in the western United States, but from the southern and eastern Mexican states of Nuevo Leon, Mexico, Oaxaca, and the Distrito Federal. Comparison with the large suites of the West Coast "*mexicana*" proves the two populations to represent distinct species.

The Mexican species at first glance is of a much "neater" habit, and upon only one specimen of the nine before me is there any indication of the dwarf axillary branches so characteristic of the West Coast species. The leaves are in much closer, more uniform whorls of 4, or very rarely 5, never 3, individuals, and they are of somewhat coriaceous or fleshy texture as evidenced by their revolute margins, a character that I have never observed in the plants of the United States. The stems of the Mexican species may be glabrate below, but in the upper portion they are marked by four pubescent lines decurrent from the bases of the leaves. The importance of these lines will be stressed further in another connection. The flowers of the Mexican species are disappointingly similar to those of the western United States, as might be expected, and the only technical distinction that I have noted is a strong tendency for the corona horns of the Mexican species to be inserted at the base of the hood, whilst they are inserted at about the middle in the species of the United States.

After such considerations, a return to Cavanilles' plate will convince most readers that the pioneer Spanish botanist had before him, in fact, not the species of the western United States, but that of southern and eastern Mexico! Nor is one in want of a name for the northern species, for *A. fascicularis* Dcne. (in DC. Prodr. 8:569. 1944), based upon a collection by Douglas (in "*Nova California*"), immediately is available, although the original description, again, is quite non-committal. In "New California" Douglas could have collected but one Milkweed with verticillate leaves.

ASCLEPIAS GALIOIDES HBK. VS. A. SUBVERTICILLATA (GRAY) VAIL

Because of its poisonous properties, stockmen throughout the western plains of the United States, from Nebraska to Texas and westward to Idaho and Arizona, usually are familiar with the plant widely known as "*Asclepias galioides* HBK.". This species closely resembles the frequent *A. verticillata* L. of the East from which it is distinguished, occasionally with some difficulty, by means of its more extensive taproot system and tendency to the production of dwarf, microphyllous, axillary branches similar to those of the closely related *A. fascicularis* Dcne. As in the latter species also, the leaves of this plant are predominantly ternate, but occasionally 4-5-nate or opposite, particularly above and upon the microphyllous dwarf shoots. Because of the variability of the leaf whorls, Dr. Gray proposed for certain of these plants the name *A. verticillata* var. *subverticillata* (Proc. Amer. Acad. 12:71. 1876), which was raised to specific rank by Miss Vail in 1898 (Bull. Torrey Club 25:178). In my studies I have made every effort to distinguish *A. subverticillata* from the commonly recurrent "*A. galioides*", but, because of the general variability of the population as a whole, have come to the conclusion that they are not even varietally distinct.

Asclepias galioides, as originally described by Kunth (HBK. Nov. Gen. & Sp. 3:188. 1819) was based upon a Mexican plant collected "*inter Valladolid de Mechoacan et lacum Cuiseo*" (Bonpland 4304 in Hb. Paris or Berlin), which is unavailable to us at present and may be permanently lost. No illustration accompanies the text, and the description as a whole is scarcely definitive with the exception of the brief introductory diagnosis: "*A. caule suffruticosa, ramoso, quadrifariam piloso; foliis quaternis, subsessilibus, erectis, linearibus, margine revolutis, uninerviis, glabris, folia 2-2½ pollices longa, 1-1½ lineas lata.*"

Here, at least, is a definite geographical citation, from the highlands of Michoacan, with a critical description of the stem and foliage. If we now turn to the herbarium of the Missouri Botanical Garden, we find that there are two elements amongst the Mexican specimens labelled as "*A. galioides*." More numerous are plants from the north-central plains and foothills of Chihuahua, Coahuila, Durango, and northwestern San Luis Potosi, which agree perfectly with the plants of the adjacent plains of the United States, having predominantly ternate leaves 0.1-0.3 cm. broad and stems which are either glabrous or with two decurrent lines of pubescence. But amongst the lot are three specimens from the high Sierra Madre Oriental of Nuevo Leon (Muller & Muller 248), San Luis Potosi (Parry & Palmer 584), and Mexico (Hahn s. n.) which obviously would have been distributed as *A. mexicana* but for their quaternate slightly narrower leaves (0.2-0.5 cm. broad), and stems which also show plainly the four pubescent lines characteristic of typical *A. mexicana* as represented by our collections, and as noted by Kunth. Since a "Paris line," probably intended by Kunth, equals 2.325 mm., it is fairly obvious that the true *A. galioides* HBK. is only an intergrading

narrow-leaved phase of *A. mexicana* Cav., the lance-elliptic leaves of which vary from 0.3 to 1.0 cm. broad upon the basis of our present representation. The proper designation of "*A. galioides*" of the plains of the west-central United States and adjacent north-central Mexico, therefore, is *A. subverticillata* (A. Gray) Vail.

THREE SUBSPECIES OF ASCLEPIAS TUBEROSA

One of the most beautiful and familiar Asclepiads of the United States is the commonly orange-flowered Butterflyweed, the inclusive species *A. tuberosa* L., which ranges roughly from Massachusetts to peninsular Florida and westward to Colorado and Arizona. The plants commonly assigned to *A. tuberosa* are notoriously variable, and it is not unnatural that there are two opposed views concerning them.

The less conservative view is that of the late Dr. John K. Small, who was able to recognize three specific entities in the complex and keyed them as follows in his 'Flora of the Southeastern United States' (ed. 1, p. 941. 1903):

- | | |
|--|------------------------|
| Hoods linear-oblong or linear-lanceolate, the interior folds meeting the margins near the apex; calyx-lobes barely $\frac{1}{3}$ as long as the corolla-lobes. | |
| Leaf-blades oblong, obtuse; follicles slender-fusiform..... | 1. <i>A. decumbens</i> |
| Leaf-blades lanceolate-oblong or linear-lanceolate, acute or rarely obtuse; follicles fusiform..... | 2. <i>A. tuberosa</i> |
| Hoods broadly oblong, the interior folds vanishing remote from the apex; calyx-lobes nearly $\frac{1}{2}$ as long as the corolla-lobes..... | 2a. <i>A. Rolfsii</i> |

In the text, Dr. Small indicated the distribution of *A. decumbens* L. as, "In dry fields, New York, Ohio and Illinois to North Carolina and Florida. Occurring also probably elsewhere further north"; that of *A. tuberosa* L. as, "In dry fields, Maine to Ontario, Minnesota, Colorado, Florida, Texas and Arizona"; and that of *A. Rolfsii* Britton as, "In pine lands, southern peninsular Florida."

The second edition of Small's 'Flora' treats the complex precisely as in the first. However, his 'Manual of the Southeastern Flora' (p. 1068. 1933) presents a surprisingly different key for the same three species:

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|--|------------------------|
| Leaf-blades acute or acutish, lanceolate or lance-elliptic; horn very slender. | |
| Calyx-lobes $\frac{1}{3}$ the length of the corolla-lobes or less; hood narrowly elliptic..... | 1. <i>A. decumbens</i> |
| Calyx-lobes nearly as long as the corolla-lobes; hoods obovate..... | 2. <i>A. tuberosa</i> |
| Leaf-blades obtuse and broadly rounded, pandurate; horn very stout..... | 3. <i>A. Rolfsii</i> |

The distributions are somewhat altered as follows: for *A. decumbens*, "Dry fields, various provinces, Fla. to Tex., Ill., and N. Y., probably also further north"; for *A. tuberosa*, "Dry fields, various provinces, Fla. to Tex., Ariz., Minn., Ont., and Me."; and for *A. Rolfsii*, "Pinelands, Coastal Plain, Fla. to S. C.". Perhaps the chief impression to be received from Dr. Small's two treatments of our problem might be summarized as considerable uncertainty regarding morphological criteria, and suspiciously coincident geographical distributions, particularly of *A. decumbens* and *A. tuberosa*.

The more conservative view of the *A. tuberosa* problem recently has been expressed very forcibly in a letter to me by Professor M. L. Fernald, which I wish to quote:

"In my own work and in the treatment of the genus for the Manual, I have found it impossible to draw any geographic or morphological lines in *A. tuberosa* except for possibly minor forms. The type, of which I have a photograph, of *A. tuberosa*, that is, the specimen in the Linnean Herbarium when he prepared Species Plantarum and which was marked by him K [Kalm] *tuberosa*, has oblong leaves broadly rounded or auricled at base and somewhat clasping. We have no photograph of the type of *A. decumbens*, but that was a Virginian plant, presumably based on a Clayton specimen (Gronovius) from a region where Clayton could have collected almost anything in the group.

"As I look over our material, and as I know intimately the plant in eastern Virginia, it is heteromorphic, and one can get any color that he wishes to collect, from the ordinary plant with vivid orange hoods and reflexed carmine perianth to others with the hoods red, and others with them pale to bright yellow, and others with hoods and perianth bright yellow. These color-variations which are helter-skelter, occur on plants with strongly ascending stems or others with the stems lopping while the leaves may be anything from broadly rounded at base and subclasping to subcuneate at base in the same or adjacent patches. They may be narrowly ovate, narrowly oblong, oblong- or linear-lanceolate, round-tipped or acute and, as I said, I have personally abandoned all hope of getting any tangibility into the series. It is certainly not divisible into one lot growing (as you express it) north and west of the Ohio, as contrasted with others growing farther south and east, for on the coast from New England southward we can find plenty of specimens with broad-based leaves to match the most extreme plants farther west, while from Michigan, Indiana, or Minnesota we can find plenty of specimens with the leaves as narrow and oblong as in the more extreme plants of the Atlantic states.

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"Certainly the type of *A. tuberosa* is easily matched both east and west. Coming from Kalm, it naturally did not come from north or west of the Ohio, but presumably from New Jersey or eastern Pennsylvania, for Kalm had his headquarters in that vicinity. And *A. decumbens*, if it was anything more than a form, was from decidedly an eastern area, where anything within the group can be found."

Professor Fernald refers to my view expressed in a previous letter to him soliciting his opinion, which was freely given as quoted. My observation had been, simply put, that the leaves of *A. tuberosa* from roughly north of the Ohio and west of the lower Mississippi Rivers are generally broadest below the middle, while those east and south tend to be broadest above the middle, although this population also contains many of nearly oblong or elliptic outline. The western population also may be said to have the leaf base predominantly truncate or cordate, while the eastern population varies from narrowly cuneate to somewhat cordate, as Professor Fernald testifies. In Florida, a third population occurs, currently known as *A. Rolfsii*, in which the leaves tend to be broadest above the middle, but usually more or less conspicuously hastate at the base, although rarely cuneate as in the more northern plants.

In the material of *A. tuberosa* generously lent for my study by the Gray Herbarium, I was very interested to find a sheet from the herbarium of Dr. Gray upon which are pasted two separate collections in the manner commonly employed in former times. The specimen to the right was collected by Oakes at Plymouth, Mass., and shows the oblong-oblongate, broadly acute leaves to good advantage; the specimen to the left was collected by an unspecified person at Columbus, Ohio, and shows the broadly ovate-lanceolate leaves commonly found in the Midwest. In the extreme lower left corner of the sheet, Dr. Gray had affixed a label bearing the annotation "*Asclepias tuberosa* L.", and another label directly beneath the plant from Ohio bears the designation "var. *decumbens*". The latter annotation can have little claim to validity as typifying the proper nomenclature for the western population, since *Asclepias tuberosa* var. *decumbens* (L.) Pursh (Fl. Amer. Sept. 1:182. 1814) indisputably was provided for Virginian plants "with the

stems lopping" as discussed by Dr. Fernald in his letter.

It should be emphasized that the three populations noted by me are radically different from the three of Dr. Small in that their ranges do not overlap extensively, much less coincide. Furthermore, I have not been able to observe any significant morphological characters distinguishing the three species as noted by Small; his calyx lobe-corolla lobe ratios particularly have proved to be unreliable. The problem as I see it principally concerns leaf variation.

At this point we should examine the basic nomenclature of the three populations that I have observed. That of *A. Rolfsii* may be disposed of easily, since it is a modern species based upon a specimen deposited in the herbarium of the New York Botanical Garden and collected by the late Dr. N. L. Britton at Miami, Fla. This plant bears the more or less hastate leaves characteristic of the vast majority of the peninsular population. Concerning the Linnaean *AA. tuberosa* and *decumbens*, I can best refer again to Professor Fernald's letter, since the receipt of which I have been allowed to examine the photograph he mentioned. The leaves of this "type" of *A. tuberosa* in all respects are similar to those of the eastern population as a whole, being oblong-ob lanceolate, distinctly widest above the middle, broadly acute to obtuse at the tip, and gradually tapering to a narrow truncate or obscurely auriculate base. Professor Fernald's observations concerning the variability of the stem posture of the eastern population are particularly valuable in disqualifying that specific character ascribed to *A. decumbens* by Linnaeus.

All this, of course, leaves the western population without a specific name, unless I again have overlooked an obscure reference in Rafinesquiana. Nor do I find an appropriate varietal designation, although a few adjectives for color-forms have been proposed. I am proceeding to describe all three populations as subspecies, a category in great disuse if not misuse amongst contemporary plant systematists.

ASCLEPIAS TUBEROSA ssp. *tuberosa* Woodson, nom. nov.

Asclepias tuberosa L. Sp. Pl. 217. 1753.

Asclepias decumbens L. loc. cit. 216. 1753.

?*Asclepias revoluta* Raf. Fl. Ludov. 51. 1817.

Asclepias Floridana Lam. Encycl. 1:284. 1783.

Asclepias tuberosa var. *flexuosa* James, in Bot. Gaz. 13:271. 1888.

Acerates Floridana (Lam.) Hitchc. in Trans. Acad. Sci. St. Louis 5:508. 1891, as to name-bringing synonym only.

ASCLEPIAS TUBEROSA ssp. *Rolfsii* (Britton) Woodson, stat. nov.

Asclepias Rolfsii Britton, apud Small, Fl. Southeast. U. S. ed. 1. 943. 1903.

ASCLEPIAS TUBEROSA ssp. *interior* Woodson, ssp. nov. Plantae speciei habitu inflorescentiaque congruentes, in regione typica i. e. praecipue in planitiibus centro- et austro-occidentalibus foliis basim versus plus minusve latioribus semper ferme varie ovatis vel lanceolatis apice sensim acuminatis basi plerisque plus minusve cordatis vel non rare truncatis, ad regionem orientis i. e. prope fl. Ohiense et Mississippense inferiore regioni ssp. *tuberosae* adjacentes ibique foliis saepe fere

oblongis vel ellipticis apice acutis nisi fere obtusis basi minus frequenter cordatis non rare fere cuneatis. — Exemplum typicum: IOWA: CLAY: level moist prairie six miles north of Ruthven, Sept. 4, 1944, *A. Hayden 3195* (Herb. Missouri Bot. Gard., TYPUS).

Although intergrading specimens will constitute a recurring nuisance, as is to be expected in subspecies occupying contiguous ranges, the following key should be of some help in identifying specimens of the three subspecies:

Leaves typically obovate to linear-oblongate, i. e. broadest above the middle, intergrading to oblong and elliptic, particularly westward, the apex chiefly broadly acute to obtuse or rounded, the base cuneate or rounded, infrequently truncate or somewhat cordate, predominantly more or less conspicuously hastate in Florida and adjacent territory; Appalachian Mountains eastward and southward to the Coast, westward roughly to the Ohio and lower Mississippi Valleys.

Leaves uniformly rounded or cuneate toward the base from above, or infrequently about, the middle, the margins essentially flat or somewhat revolute; distribution cited above, except Florida in general.....ssp. *tuberosa*

Leaves predominantly with a more or less conspicuous hastate dilation toward the base, infrequently abruptly truncate, cordate, or essentially cuneate, the margins commonly more or less crisped; Florida and closely adjacent territory.....ssp. *Rolfsii*

Leaves typically ovate to oblong-lanceolate, i. e. broadest below the middle, intergrading to oblong and elliptic, particularly eastward, the apex chiefly acuminate or narrowly acute, the base truncate or cordate, the margins flat or somewhat revolute; Arizona, southern Utah, and eastern Colorado to southern Minnesota and eastward to the Ohio and lower Mississippi Valleys...ssp. *interior*

I have accumulated a considerable mass of statistical data which I intend to publish elsewhere, and which I have no doubt will constitute a convincing proof of the genetic significance of the three subspecies. The category of subspecies has been employed because the data obtained indicate that when graphically presented the character scores will coincide satisfactorily with the "continuous stepped cline" distinguished by J. S. Huxley (Bijdr. Dierk. 27:491. 1939) for numerous subspecies of animals. Huxley's "clines" undoubtedly will be found valid, if not extensible, when that method is applied widely to plant populations. I should explain further that I have decided to follow a suggestion of Huxley (in 'The New Systematics', Oxford, 1940, p. 37) regarding the treatment of two or more intergrading populations: thus I have labelled intergrading specimens, particularly in the Ohio and lower Mississippi Valleys, as "*Asclepias tuberosa* cl. *tuberosa-interior*," the abbreviation denoting the word "cline." I consider that this form of label is convenient, approximates biological reality, and is far more satisfactory than arbitrarily to assign an intergrade either to *A. t. tuberosa* or to *A. t. interior*. This method doubtless may be used in the case of intergrading varieties as well.

(To be continued)

EXPLANATION OF PLATE

PLATE 20

Asclepias tuberosa ssp. *tuberosa* and *A. tuberosa* ssp. *interior*. Explanation in the text.



WOODSON—SOME NORTH AMERICAN ASCLEPIADS